CLAIMS

What is claimed is:

1. A method for determining a fuel combustion time interval for pre-heating a hydrocarbon catalytic reformer from a starting temperature to a minimum reforming temperature utilizing a electronic control module, comprising the steps of:

a) selecting a fuel type to be combusted;

b) determining the latent heat of combustion of said selected fuel type;

c) selecting a flow rate of said combustion fuel;

d) determining the heat capacity of the catalyst to be heated in said catalytic reformer;

e) determining a mass of said reformer to be heated;

f) determining a starting temperature of said catalytic reformer; and

g) utilizing a software construct to produce said fuel combustion time interval, wherein said construct utilizes said latent heat of combustion, said selected combustion fuel flow rate, said heat capacity of said catalyst, said mass to be heated, and said starting temperature.

2. A method in accordance with Claim 1 wherein said software construct includes an algorithm, software code modules, or interface specifications.

3. A method in accordance with Claim 1 wherein said software construct is an algorithm having the linear form $y = mx + b$.

4. A method in accordance with Claim 3 wherein

y is said minimum reforming temperature;

b is said starting temperature;

m is an integral of a product of said latent heat of combustion times said selected flow rate of said combustion fuel, divided by a product of said mass to be heated times the heat capacity of said mass; and

x is said fuel combustion time interval.

5. A method in accordance with Claim 1 wherein said minimum reforming temperature is about 500°C.

6. A fuel cell apparatus for generating electrical energy from catalytic combustion of hydrogen, comprising:

a) a fuel cell assembly;

b) a catalytic hydrocarbon reformer for supplying reformate to said fuel cell assembly; and

c) an electronic control module for controlling the flow of hydrocarbon fuel and air into said reformer,

wherein said electronic control module is programmed with a software construct for determining a fuel combustion time interval for pre-heating said hydrocarbon catalytic reformer from a starting temperature to a minimum reforming temperature.

7. A fuel cell apparatus in accordance with Claim 6 wherein said software construct includes an algorithm, software code modules, or interface specifications.

8. A fuel cell apparatus in accordance with Claim 6 wherein said software construct is an algorithm having the linear form $y = mx + b$, and wherein

y is said minimum reforming temperature;

b is said starting temperature;

m is an integral of a product of the latent heat of combustion of said fuel times the selected flow rate of said fuel, divided by a product of the mass of said reformer to be heated times the heat capacity of said mass; and

x is said fuel combustion time interval.

9. A fuel cell apparatus in accordance with Claim 6 wherein said fuel cell assembly includes a solid oxide fuel cell.

10. A computing system having a processor, a memory and an operating environment operable to execute a method for determining a fuel combustion time interval for pre-heating a hydrocarbon catalytic reformer from a starting temperature to a minimum reforming temperature, the method comprising:

a) selecting a fuel type to be combusted;

b) determining the latent heat of combustion of said selected fuel type;

c) selecting a flow rate of said combustion fuel;

d) determining the heat capacity of the catalyst to be heated in said catalytic reformer;

e) determining a mass of said reformer to be heated;

f) determining a starting temperature of said catalytic reformer; and

g) utilizing a software construct to produce said fuel combustion time interval, wherein said construct utilizes said latent heat of combustion, said selected combustion fuel flow rate, said heat capacity of said catalyst, said mass to be heated, and said starting temperature.

11. A computing system in accordance with Claim 10 wherein said software construct includes an algorithm, software code modules or interface specifications.

12. A computing system in accordance with Claim 10 wherein said software construct is an algorithm having the linear form $y = mx + b$.

13. A computing system in accordance with Claim 12 wherein

y is said minimum reforming temperature;

b is said starting temperature;

m is an integral of a product of said latent heat of combustion times said selected flow rate of said combustion fuel, divided by a product of said mass to be heated times the heat capacity of said mass; and

x is said fuel combustion time interval.

14. A computing system in accordance with Claim 10 wherein said minimum reforming temperature is about 500°C.

15. A computer readable medium having computer executable instructions for performing a method for determining a fuel combustion time interval for pre-heating a hydrocarbon catalytic reformer from a starting temperature to a minimum reforming temperature, comprising the steps of:

a) selecting a fuel type to be combusted;

b) determining the latent heat of combustion of said selected fuel type;

c) selecting a flow rate of said combustion fuel;

d) determining the heat capacity of the catalyst to be heated in said catalytic reformer;

e) determining a mass of said reformer to be heated;

f) determining a starting temperature of said catalytic reformer; and

g) utilizing a software construct to produce said fuel combustion time interval, wherein said construct utilizes said latent heat of combustion, said selected combustion fuel flow rate, said heat capacity of said catalyst, said mass to be heated, and said starting temperature.

16. A computer readable medium in accordance with Claim 15 wherein said software construct includes an algorithm, software code modules or interface specifications.

17. A computer readable medium in accordance with Claim 15 wherein said software construct is an algorithm of the linear form $y = mx + b$.

18. A computer readable medium in accordance with Claim 17 wherein

y is said minimum reforming temperature;

b is said starting temperature;

m is an integral of the product of said latent heat of combustion times said selected flow rate of said combustion fuel, divided by a product of said mass to be heated times the heat capacity of said mass; and

x is said fuel combustion time interval.

19. A computer readable medium in accordance with Claim 15 wherein said minimum reforming temperature is about 500°C.